Estuary Subcommittee Update
July 2011

Sound Ecological Environment

Nueces Estuary Historical Study – SAC-sponsored

Cecilia Venable – TAMU-CC Librarian

Mercer Friends Given Oysters By the Boatload

Royal Givens Was City's Leading Seafood Merchant

By DEE WOODS

Oystering

From the Diary of Capt. John Mercer, pilot on Mustang Island, at Aransas Pass:

Wednesday, March 18, 1874. Barometer 29.3. This day the wind S. E. by E. Moderate. Very foggy. After breakfast John, Bill Moore, Captain Jones, Frank Wilson, Captain Hall went oystering.

They had a roast at the reef. Got a huge old mess. They were bully. Then, opened about 400 and brought them home. Tom Brundrett made a rudder iron and an oyster knife.

John finished hoeing the potatoes. Ned dabbed in the flower garden. Frank Stephenson laid the keel of his skiff. John caught a mocking bird but he got away.

A large schooner off the bar but too much sea for her to come in. Captain Moore went to St. Joseph's. Tom Lacey and Ned went aboard the schooner Lizzie Bell and got a bucketful of onions. John and Tom planted balsam seeds around the pavilion. So ends the day. Wind S. S. E. Very rough bar. Extra high tide.

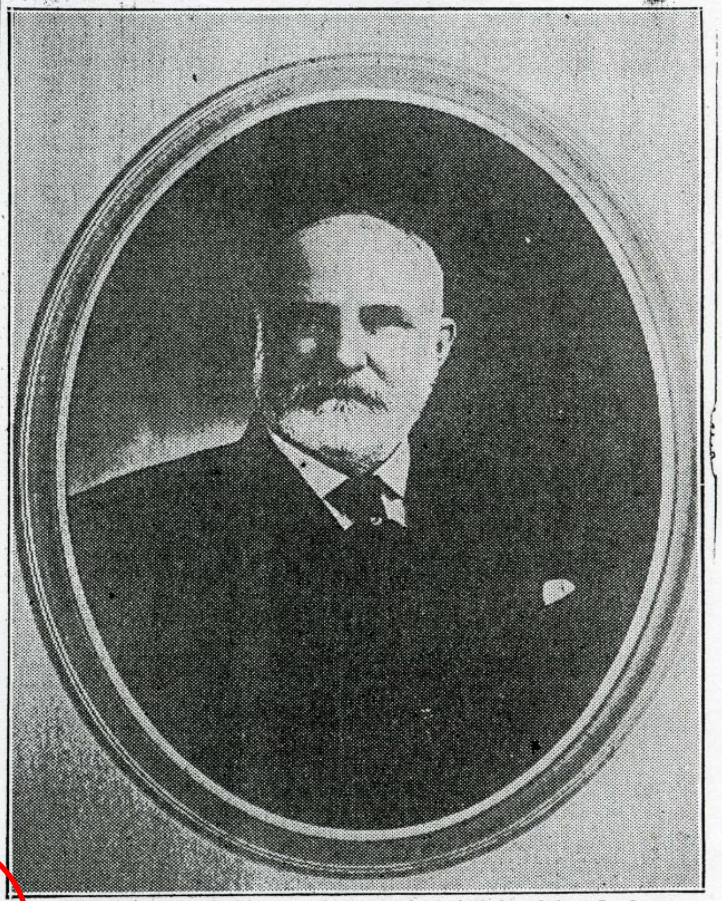
Private Oyster Beds

Oyster roasts were enjoyable affairs on Mustang Island in the 70s. The Mercer family not only prized the bivalve mollusks highly as a food, they frequently entertained guests by staging an oyster roast on the beach. Also, occasional mention is made where Captain John or Captain Ned would get hungry for oysters and wander down to the reef and have oysters for one.

Believe it or not, friends from Rockport visited the Mercers and carried boatloads of oysters home with them.

The late Royal Givens of Corpus Christi was the seafood merchant of the town. He established the Givens Packing Co. in 1908

"Drumfish King"



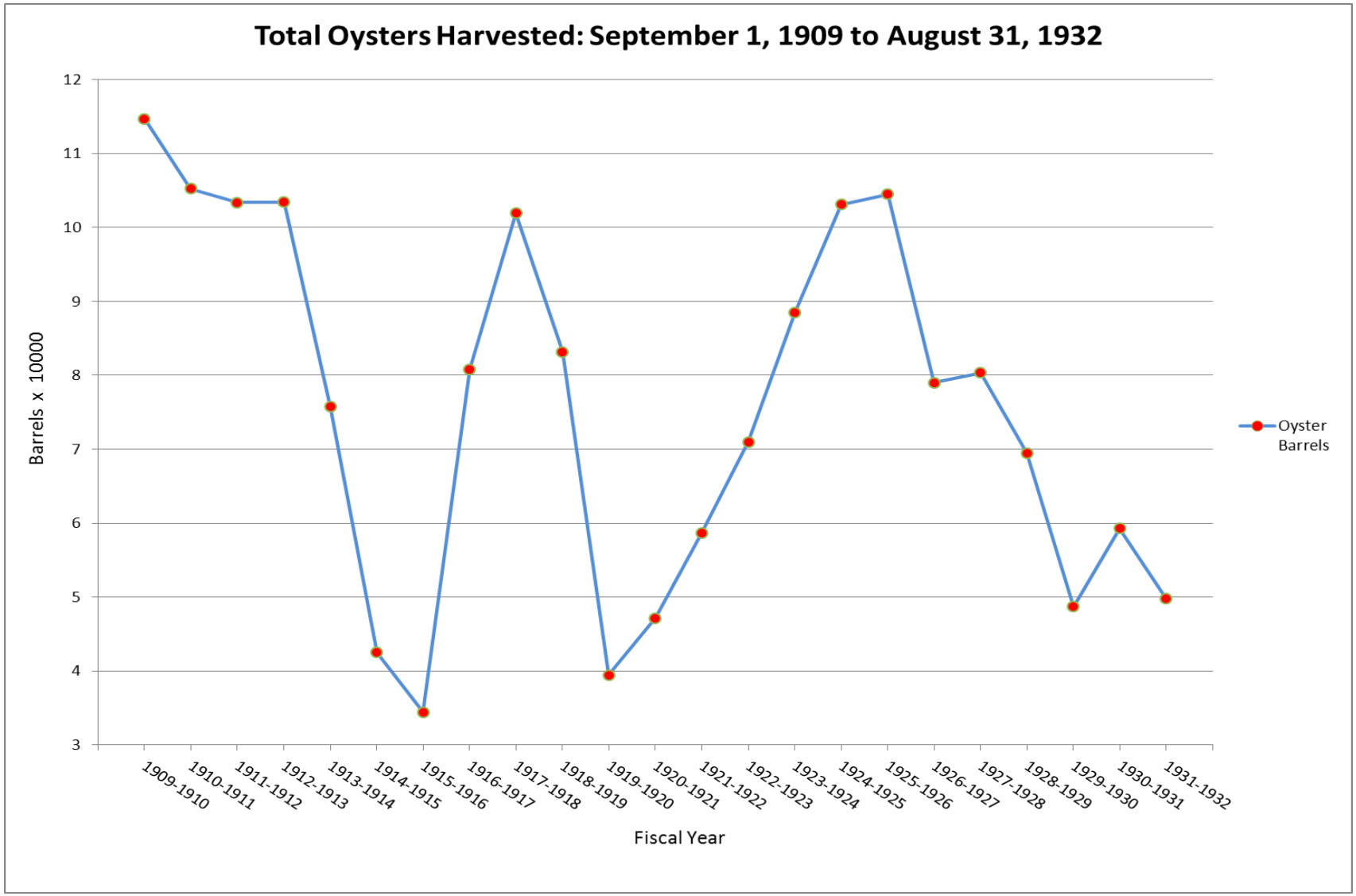
The late Royal Givens of Corpus Christi is pictured above. Those of his time knew him as "the drumfish king."

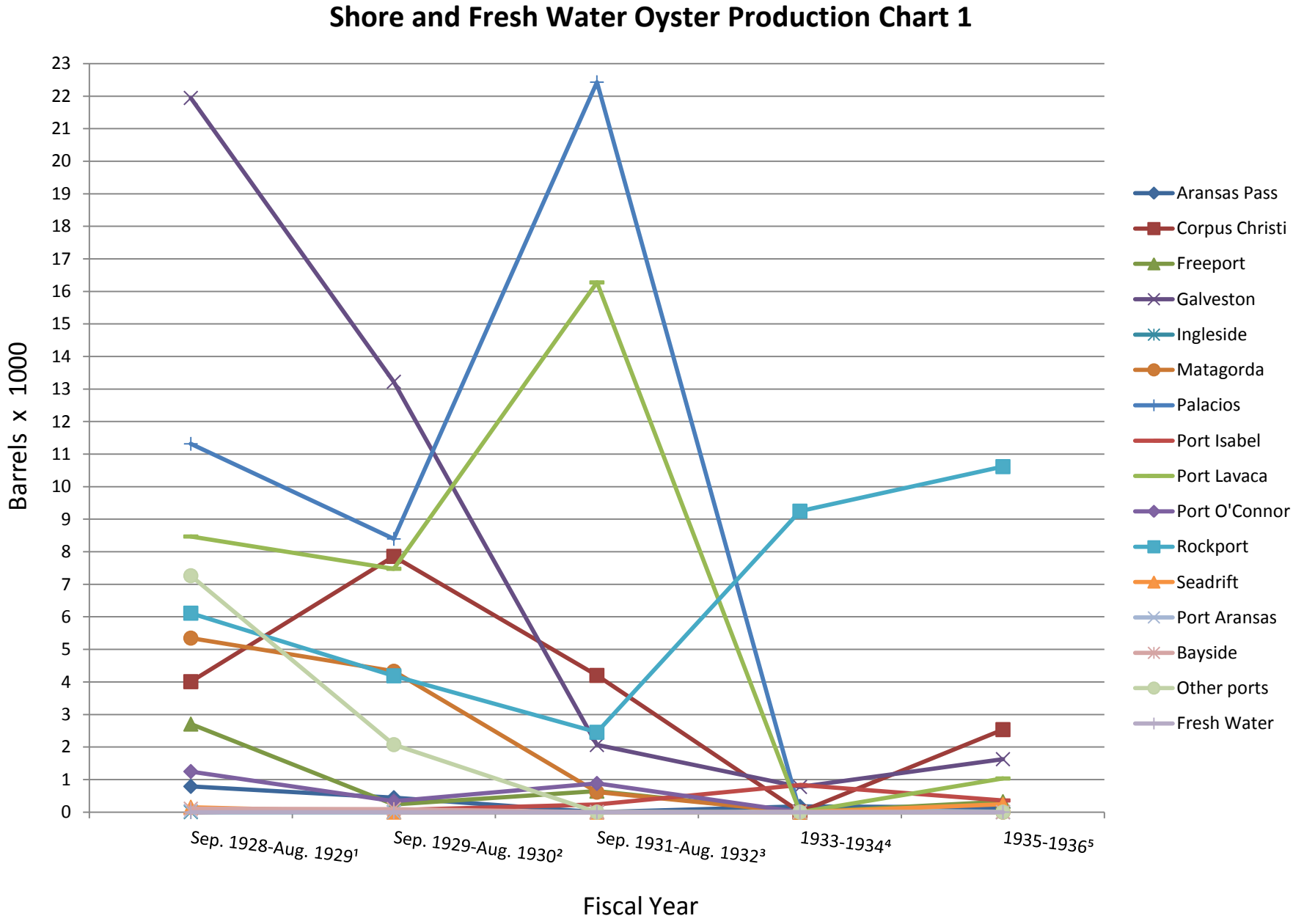
pocket and brought it out to use on the oysters.

Givens was nicknamed the drumfish king because he was the first man to ship drum from Corpus Christi. The fish was shipped by rail and Givens gave it the name "White Rock."

(To Be Continued)


SHELLING OYSTERS.
CORPUS CHRISTI, TEXAS.
©1925


Total Oysters Harvested: September 1, 1909 to August 31, 1932
Barrels x 10000
12
11
10
9
8
7
6
5
4
3
1909-1910
1910-1911
1911-1912
1912-1913
1913-1914
1914-1915
1915-1916
1916-1917
1917-1918
1918-1919
1919-1920
1920-1921
1921-1922
1922-1923
1923-1924
1924-1925
1925-1926
1926-1927
1927-1928
1928-1929
1929-1930
1930-1931
1931-1932
Fiscal Year
Oyster Barrels


Shore and Fresh Water Oyster Production Chart 1
Barrels x 1000
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Sep. 1928-Aug. 1929[1]
Sep. 1929-Aug. 1930[2]
Sep. 1931-Aug. 1932[3]
1933-1934[4]
1935-1936[5]
Fiscal Year
Aransas Pass
Corpus Christi
Freeport
Galveston
Ingleside
Matagorda
Palacios
Port Isabel
Port Lavaca
Port O'Connor
Rockport
Seadrift
Port Aransas
Bayside
Other ports
Fresh Water

- **1.2M cu yd from Nueces Bay ’58 alone (probably and underestimate)**

- **30’s oyster harvest ended → shell harvest → considered totally fished out (live and substrate) by 1967**

- **300’ rule but dredgers took advantage of “live” reefs during drought years of ‘50 and 60 ‘s**

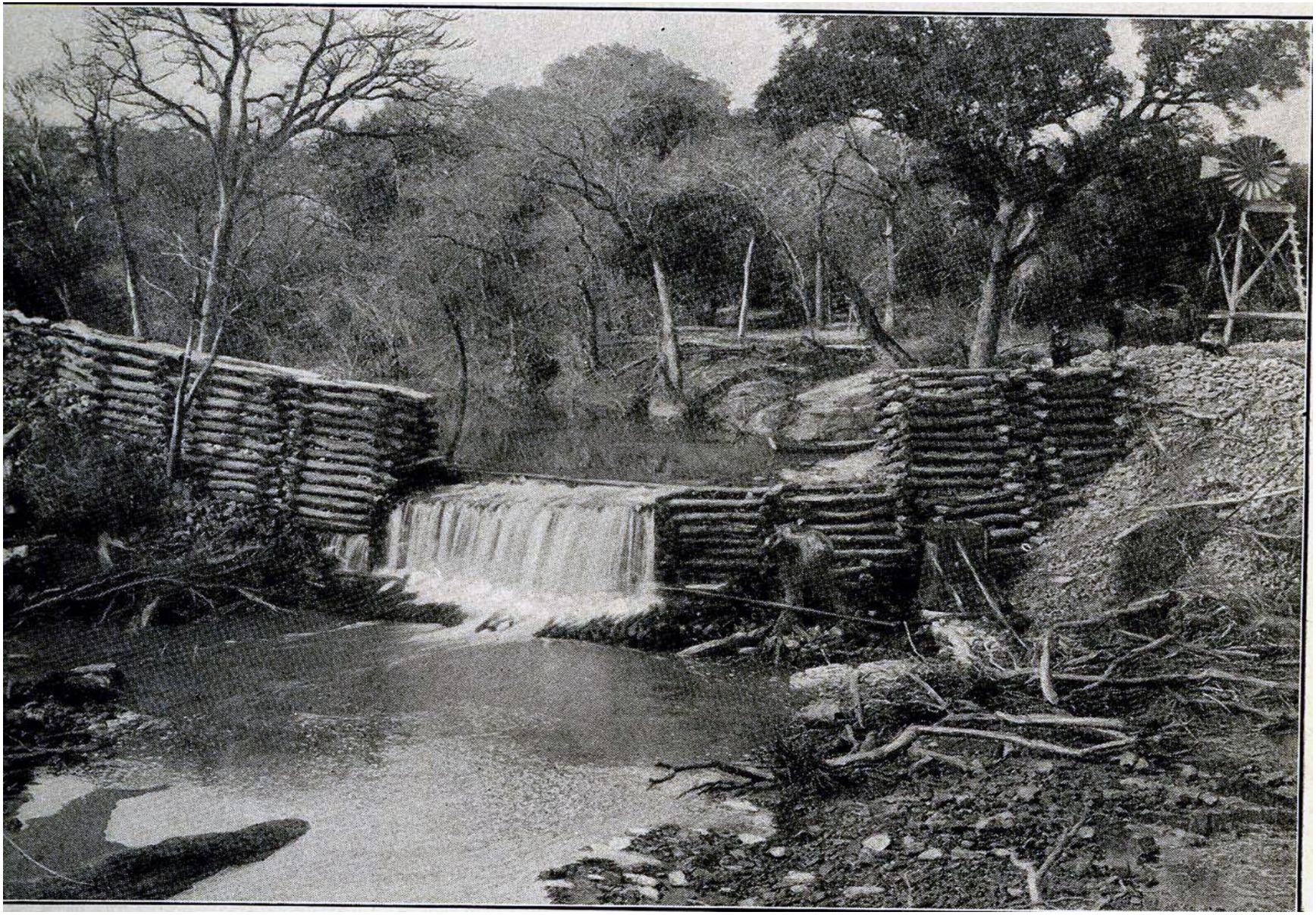


Table 2-1: Summary of mean annual flow of the Nueces River into the Nueces Estuary (1940 to 1996)[1] and upper Nueces Delta (1940 to 1999)[2]. Time periods in both studies were based upon the construction dates of large reservoirs in the watershed.

Time Period	Mean annual river flow into Nueces Estuary (acre-ft)	Percent change from Period I	Mean annual river flow into upper Nueces Delta (acre-ft)	Percent change from Period I
1940-1957	619,000	—	127,997	—
1958-1982	614,000	-0.8%	77,989	-39.1%
1983-1996(9)	279,000	-54.9%	537	-99.6%

[1] Source: Asquith *et al.* 1997.
[2] Source: Irlbeck and Ward 2000.

Note: 1 acre-ft = 1.2336 10^3 m^3

- **1958 – Lake Corpus Christi → 1 Overbanking per year**
- **1982 – Lake Choke Canyon → 1 Overbanking every 3 years**
- **Major modifications and channelization of river preventing OB**
- **Historical delivered during spring and fall "flashy" events**
- **Current Agreed Order is 138,000 ac-ft yr^{-1}**

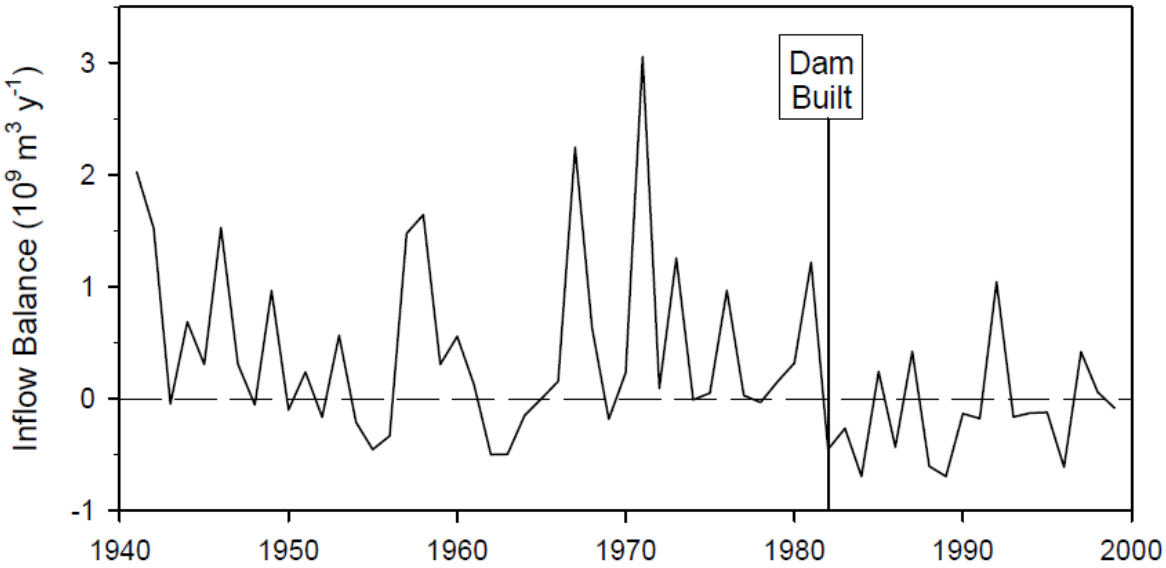


Figure 2: Average annual net inflow balance into Nueces Bay [10].

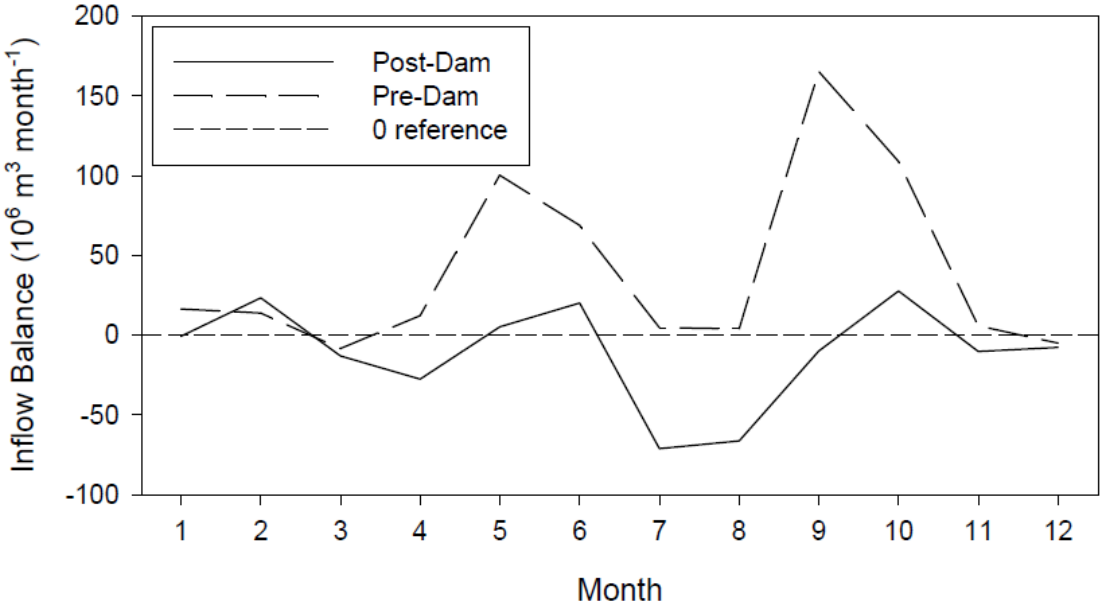


Figure 3: Average monthly inflow balance into Nueces Bay [13].

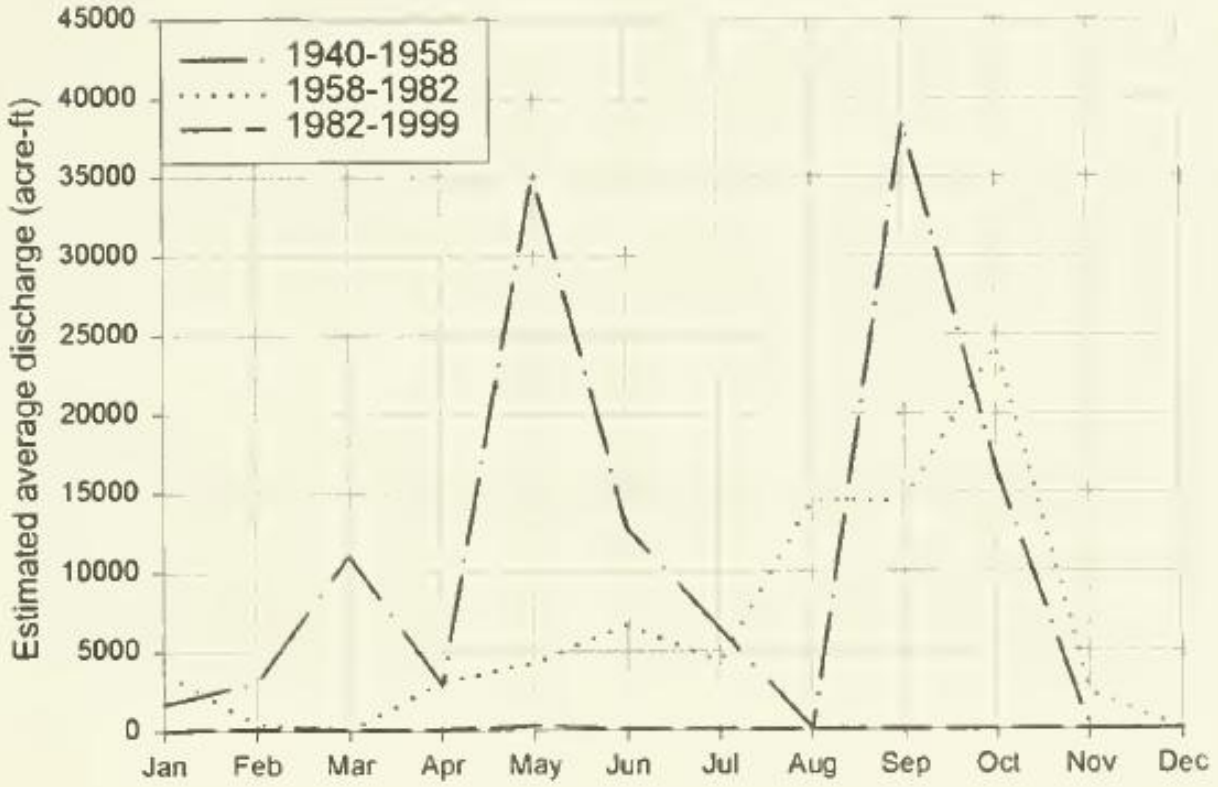
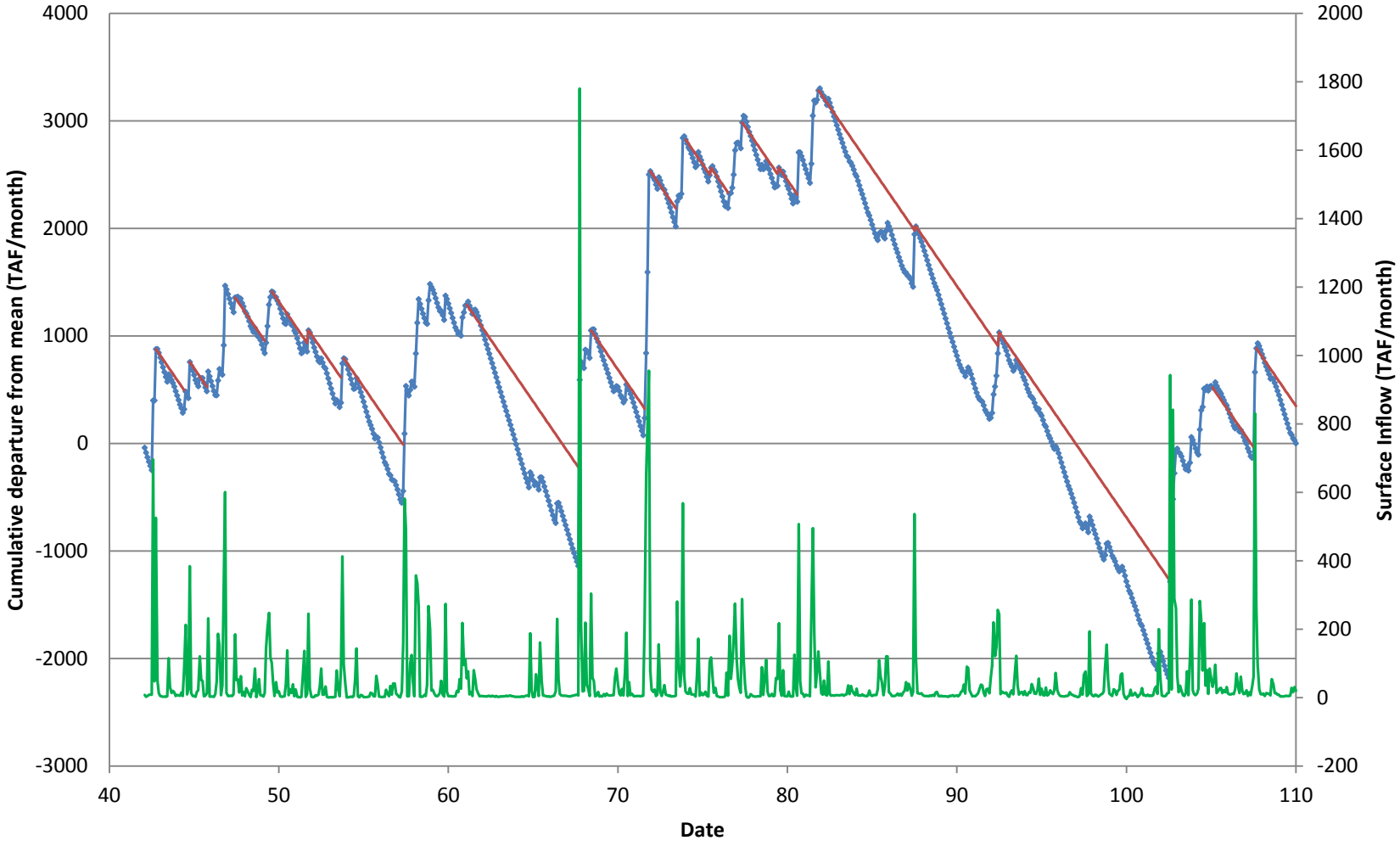
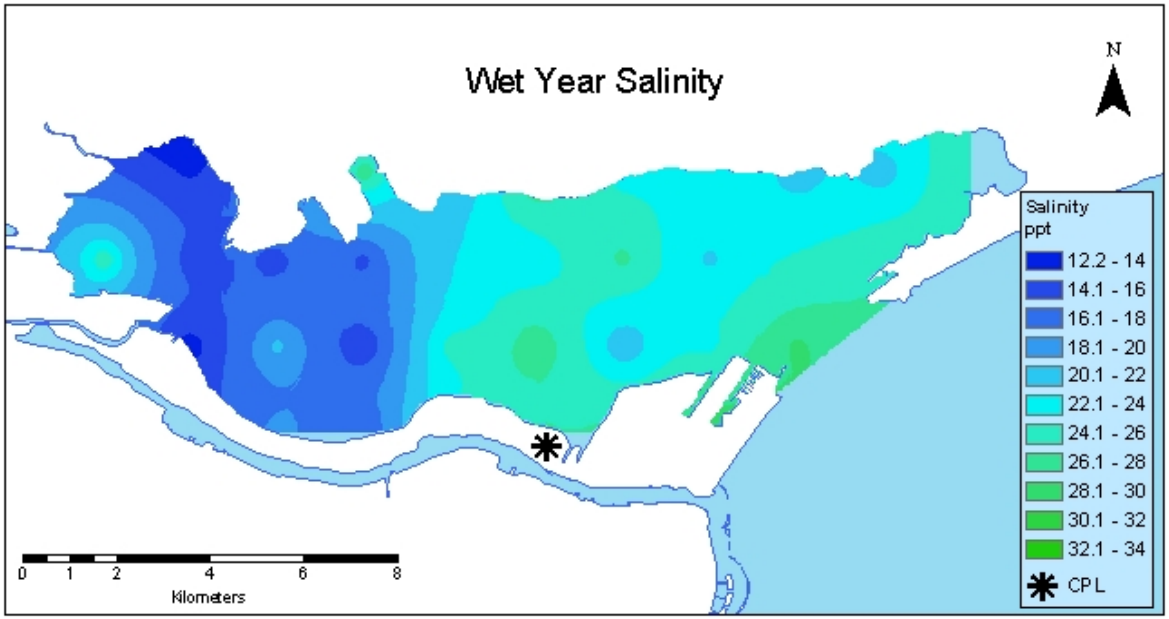


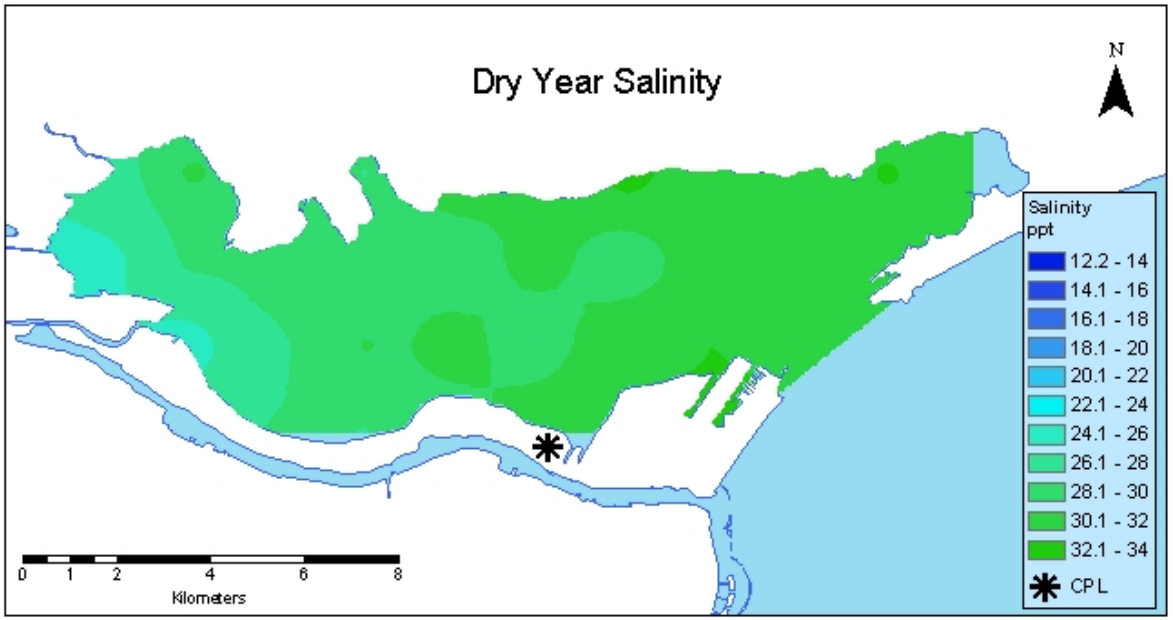
Figure 11: Historic magnitude of flow events into the upper Nueces Delta. Not included were data from the largest event in each time period.

Note: 1 acre-ft = 1.2335 10^3 m^3.


4000
3000
2000
1000
0
-1000
-2000
-3000
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-200
40
50
60
70
80
90
100
110
Date
Cumulative departure from mean (TAF/month)
Surface Inflow (TAF/month)

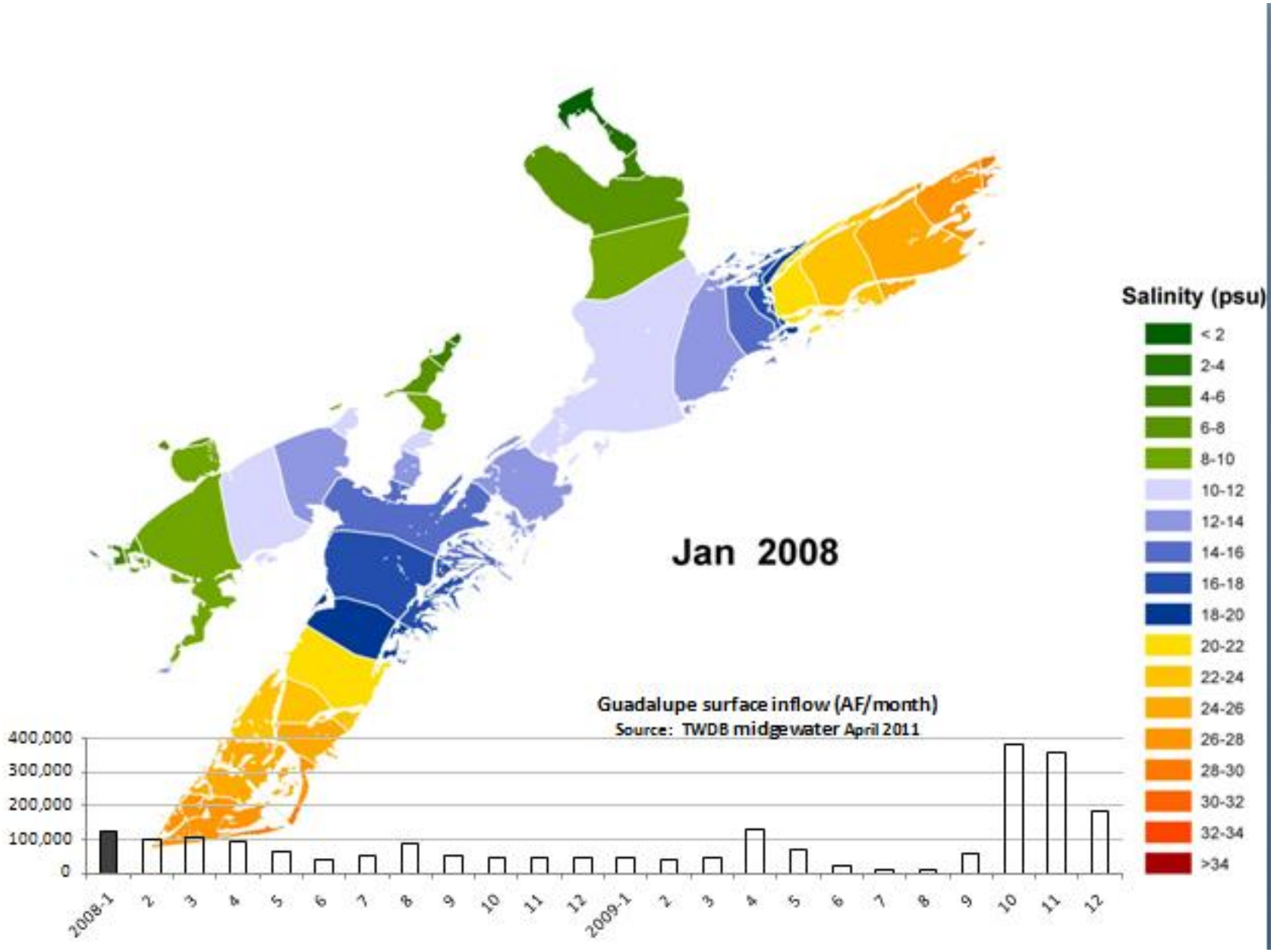
Current Conditions





1980 - 1999

Data Courtesy Terry Palmer and Paul Montagna



Data Courtesy Lynne Hamlin

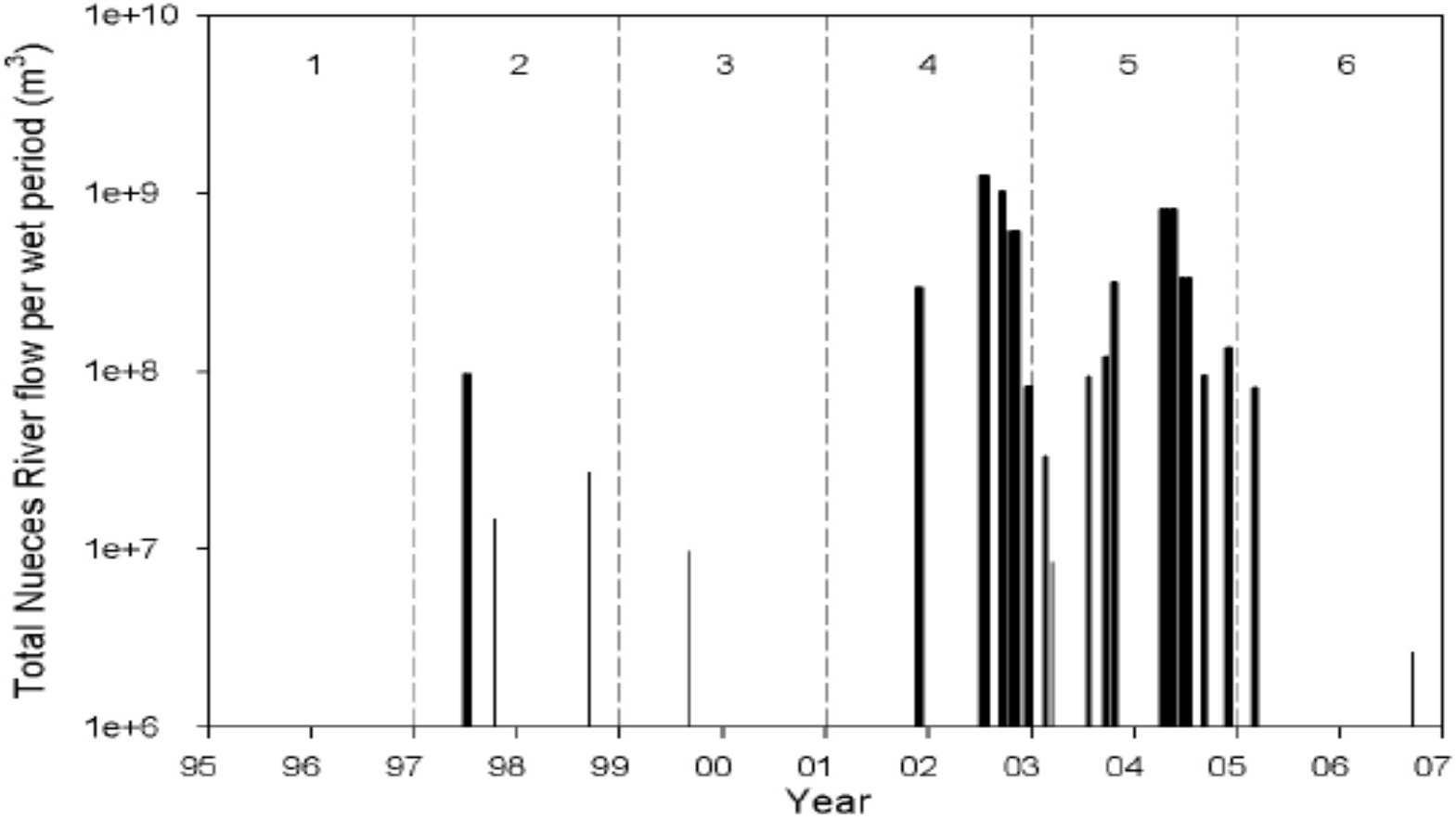
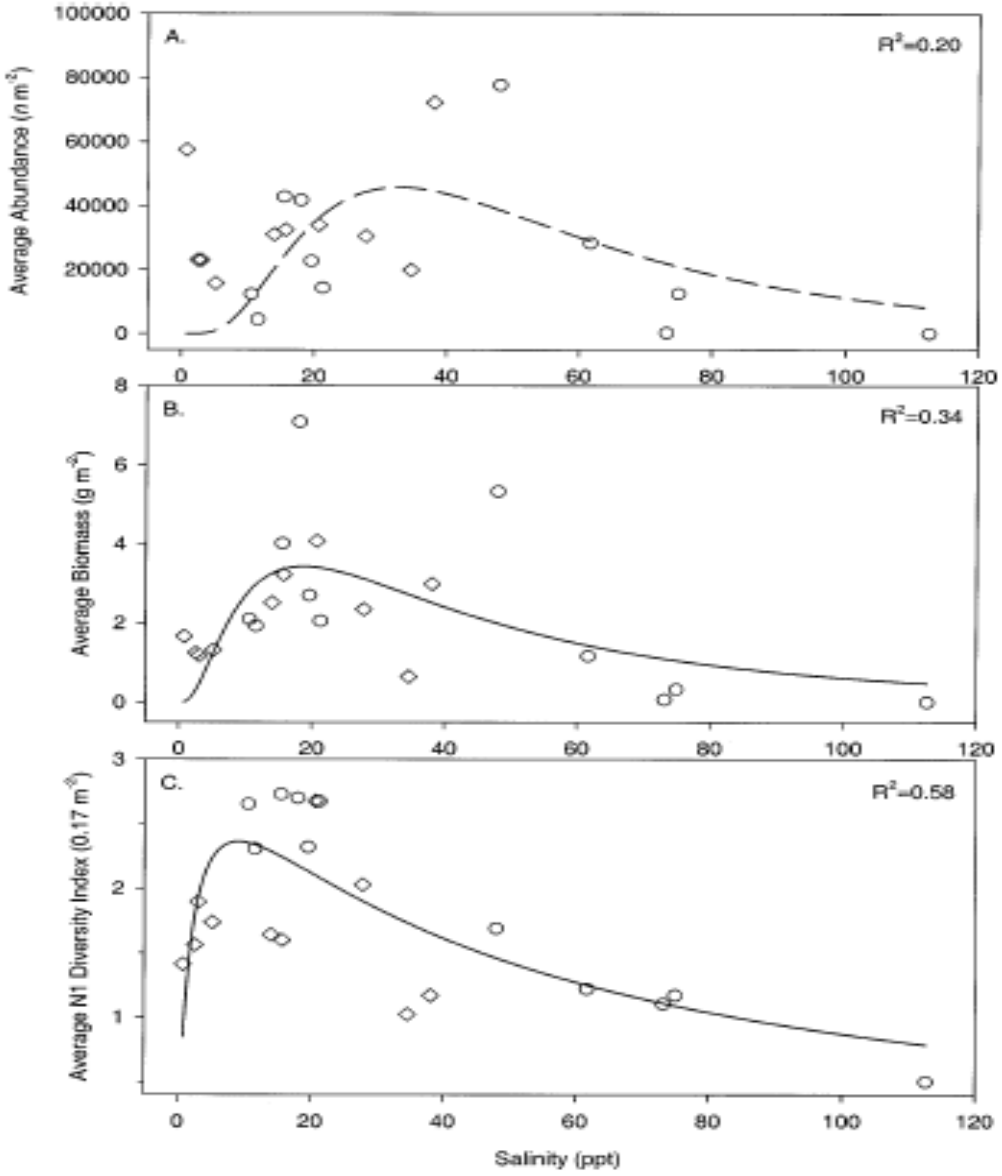


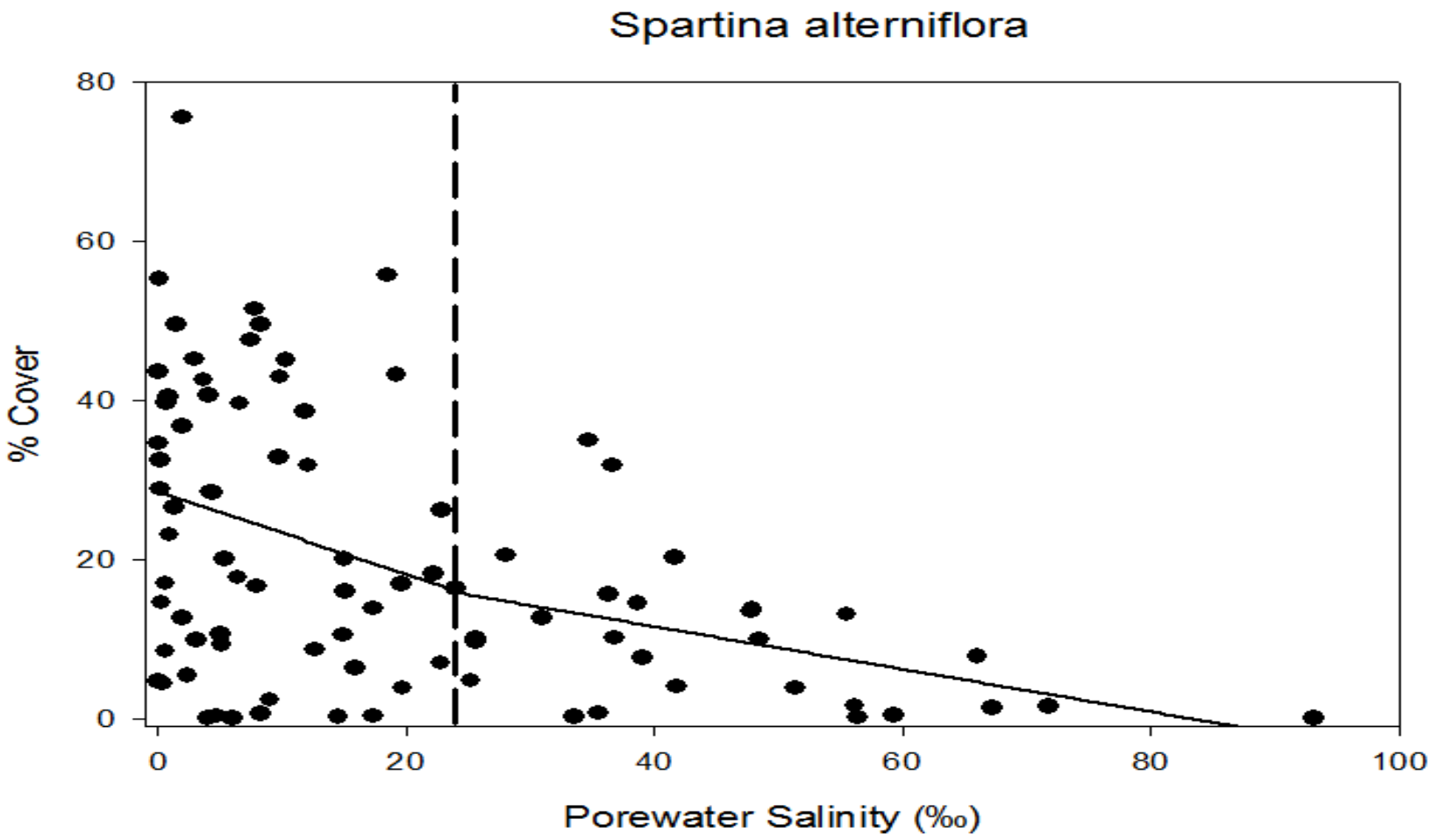
Figure 4. Wet periods over the 170 month study period. From 1 January 1994 to 10 August 2000, wet periods were classified as daily flow rates exceeding 4.2 x 10^6 m^3 Nueces River flow. From 11 August 2000 to 29 February 2008 wet periods were classified as daily flow rates exceeding 2.6 x 10^6 m^3 Nueces River flow.

Wet 1 – 2003
Wet 2 – 2004
Average – 1997
Dry - 1996

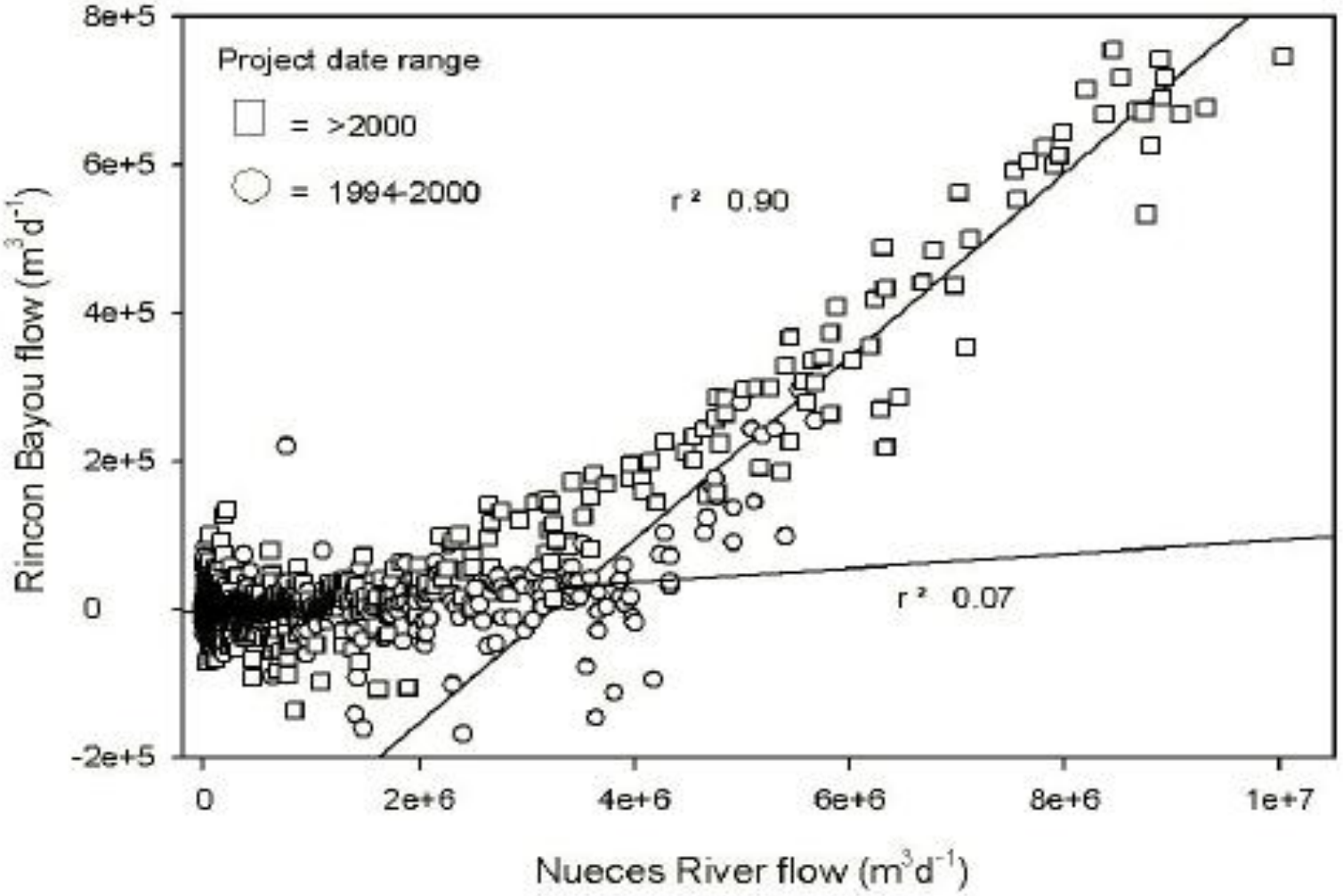
Data Courtesy Ken Dunton

Infauna response to salinity





Relationship between cover of Spartina alterniflora and porewater salinity. Piecewise linear regression indicates that a breakpoint in the relationship occurs at a porewater salinity of 25 ‰.



Paired regressions of Rincon Bayou discharge versus Nueces River discharge for no flow and positive flow into Rincon Bayou. Points are labeled by Nueces Overflow Channel project periods. 3000 acre-ft; 1500 CFS

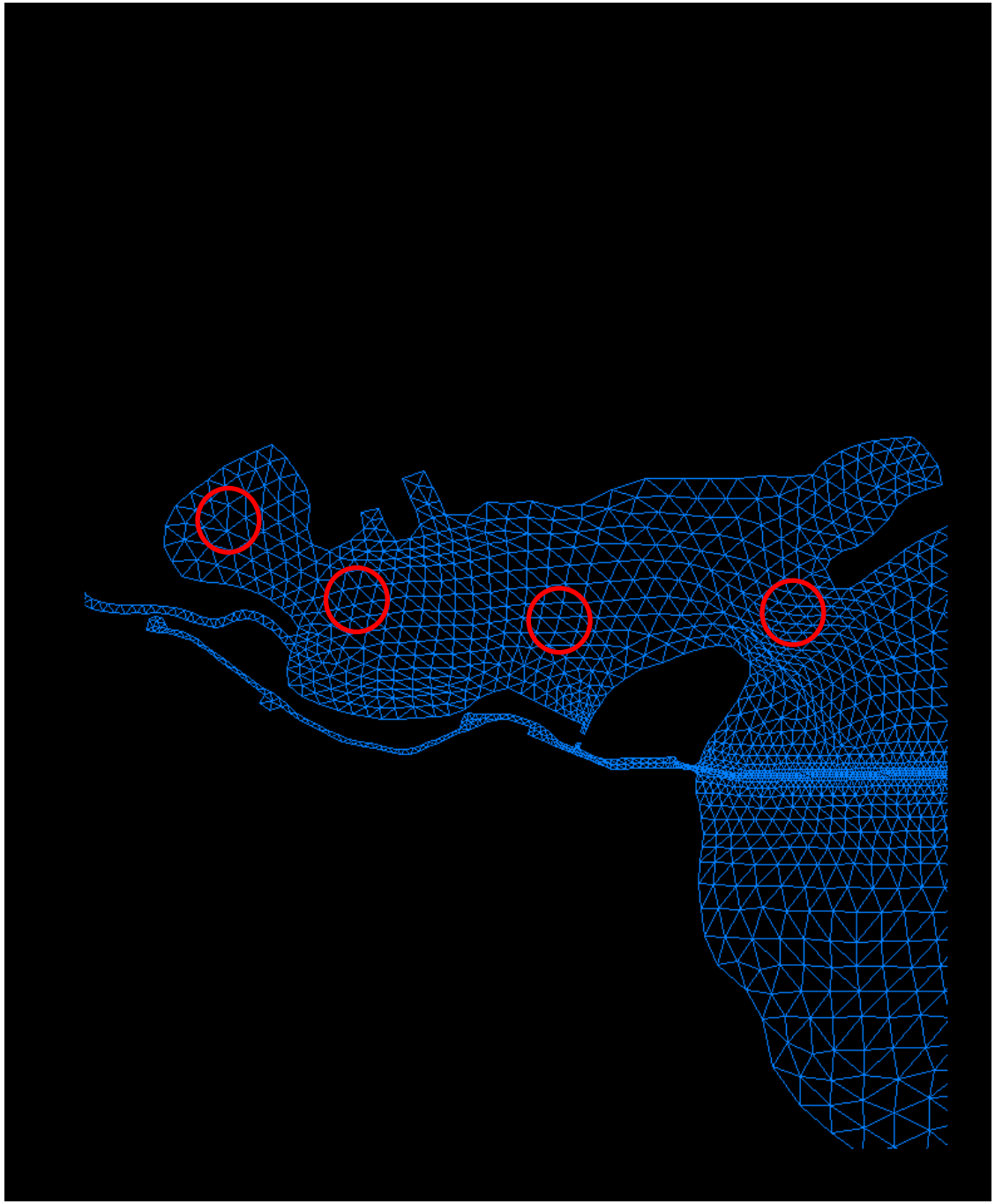
	Nueces River Flow (acre-ft)			
Nueces Delta Porewater Salinity Target (‰)	22000	90000	40000	20000
25	**Winter**	**Spring**	**Summer**	**Fall**

172,000 acre-ft y^{-1}

Flow Regime and Attainment

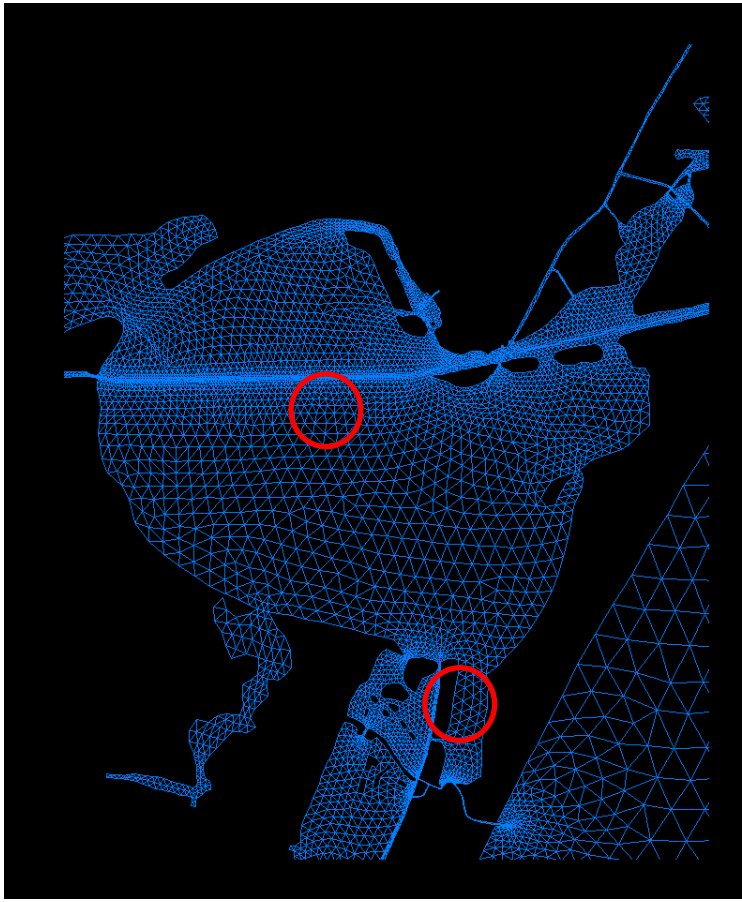
Condition	Attainment	Nueces Estuary Freshwater Inflow Regime (Acre-Feet)											
Base High	#% of yrs	# ? Acre-ft				# ? Acre-ft				# ? Acre-ft		# ? Acre-ft	
Base Medium	#% of yrs	# ? Acre-ft				# ? Acre-ft				# ? Acre-ft		# ? Acre-ft	
Base Low	#% of yrs	# ? Acre-ft				# ? Acre-ft				# ? Acre-ft		# ? Acre-ft	
Subsistence	#% of yrs	# ? Acre-ft				# ? Acre-ft				# ? Acre-ft		# ? Acre-ft	
		November	December	January	February	March	April	May	June	July	August	September	October
		Winter				Spring				Summer		Fall	

Nueces Bay



What about the bay?

TXBLEND
and
Regression Approach



Inflow Component	TWDB201101 (full hydrology)	TWDB201101 Nueces Bay	TxBLEND Nueces Bay Inflow Point (calibration hydrology)	TxBLEND Nueces Bay Inflow Point (alternate hydrology)
Gaged Watersheds	#08211000 - Nueces R. nr Mathis #08211520 - Oso Ck @ Corpus Christi	#08211000 - Nueces R. nr Mathis	#08211500 – Nueces R. @ Calallen	#08211500 – Nueces R. @ Calallen
Ungaged Watersheds	100% of all watersheds: #21010, #20005, #22012, #22013, #22011, #22014, #22015 (prior to 1977, #22010, which now is gaged by Oso Crk gage)	100% of area of #21010, 50% of area of #20005, 100% of area of #22012, 0% of area of #22013 (not included as drains to CC Ship Channel)	None included	20% of area of #21010, 50% of area of #20005, 100% of area of #22012, 0% of #22013 (not included as drains to CC Ship Channel)
Returns	All return flow data available	100% of #21010, 13% of #20005, 100% of #22012,	Return flows from Alison WWTP only	100% of #21010, 13% of #20005, 100% of #22012,
Diversions	All diversion data available	100% of diversions in #21010	n/a	n/a
The above components determine **Total Freshwater Inflow** to the estuary				
Precipitation on bay	n/a	n/a	n/a	n/a
Evaporation from bay	n/a	n/a	n/a	n/a
The above components determine the **Freshwater Inflow Balance** of the estuary				

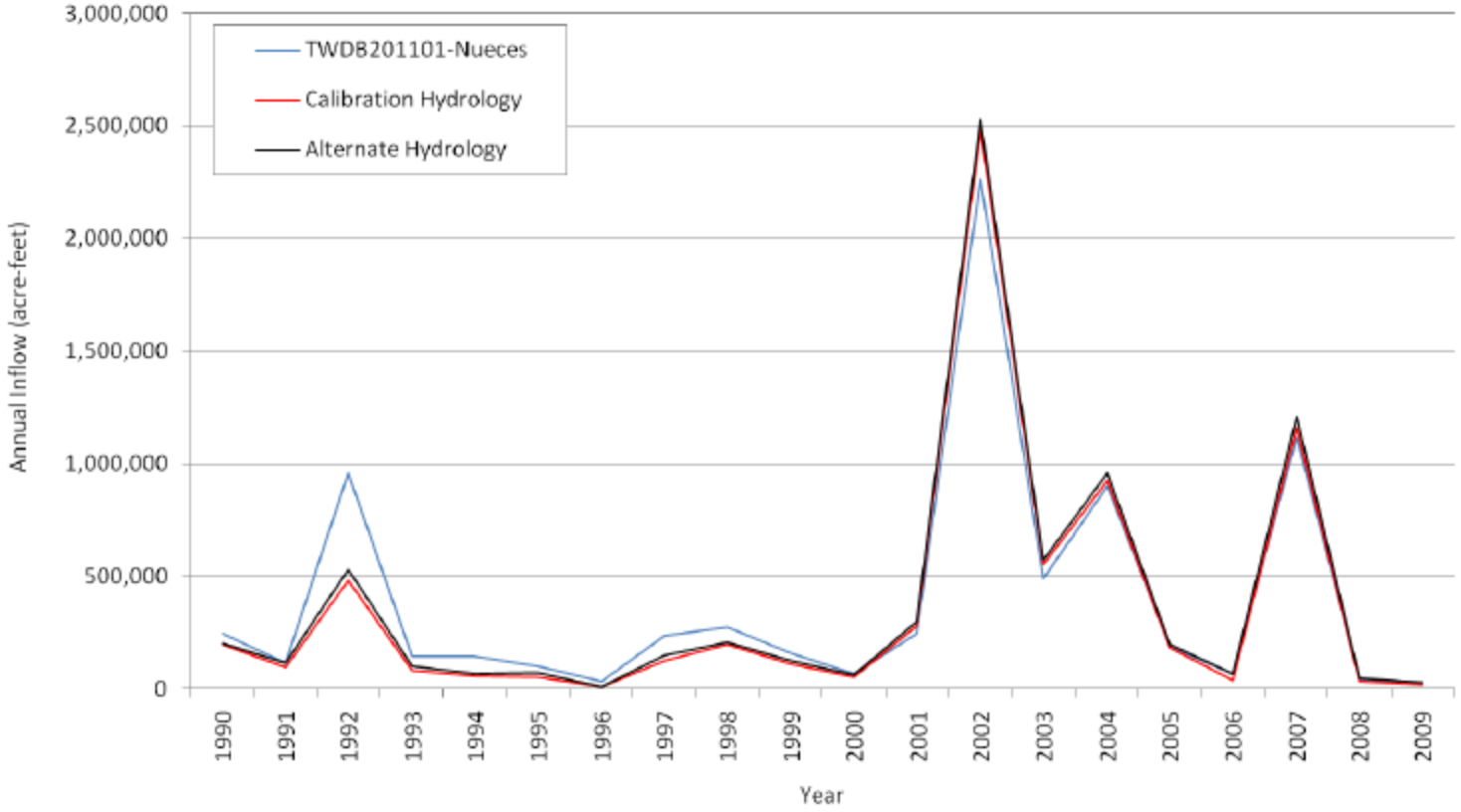
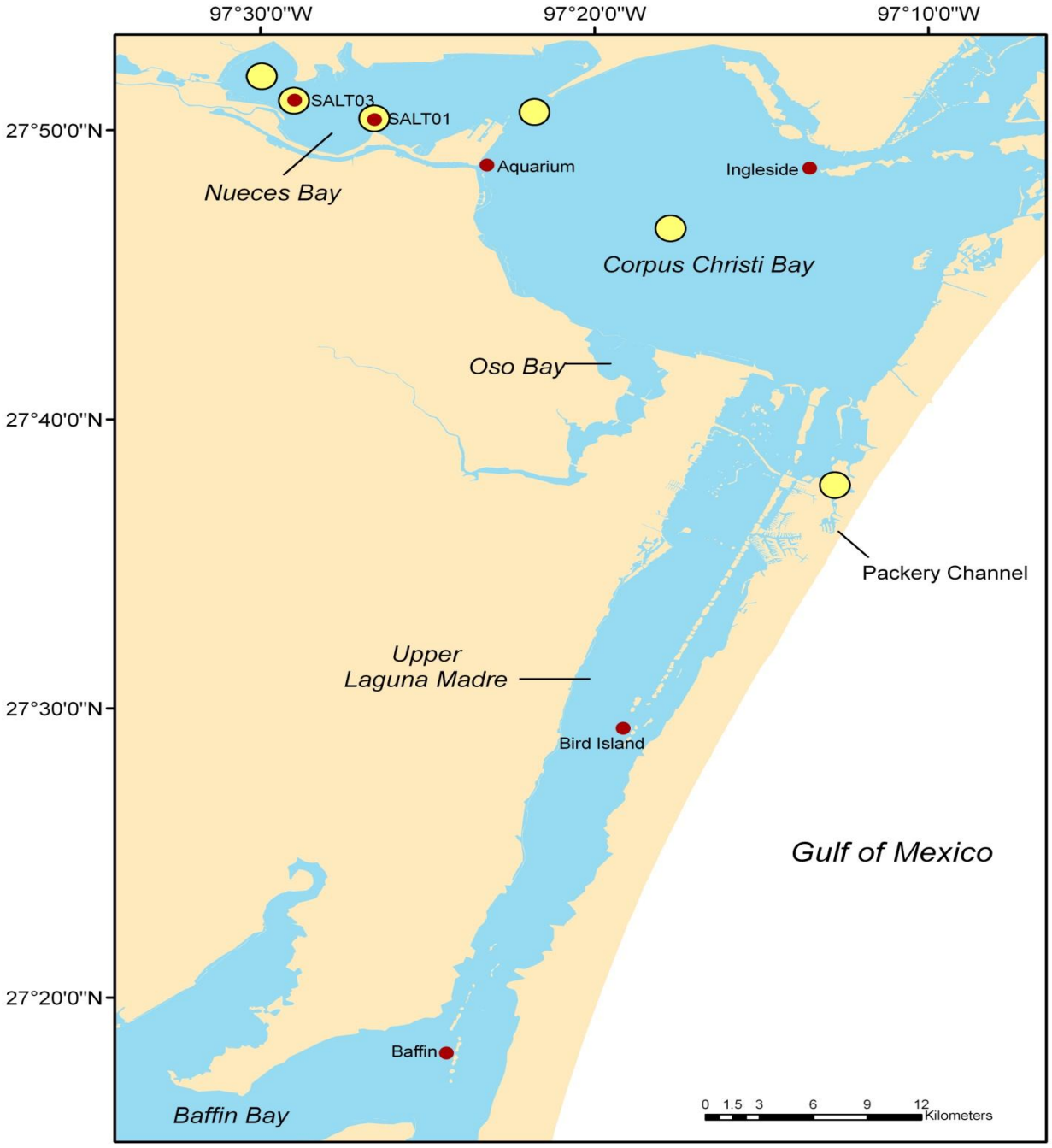
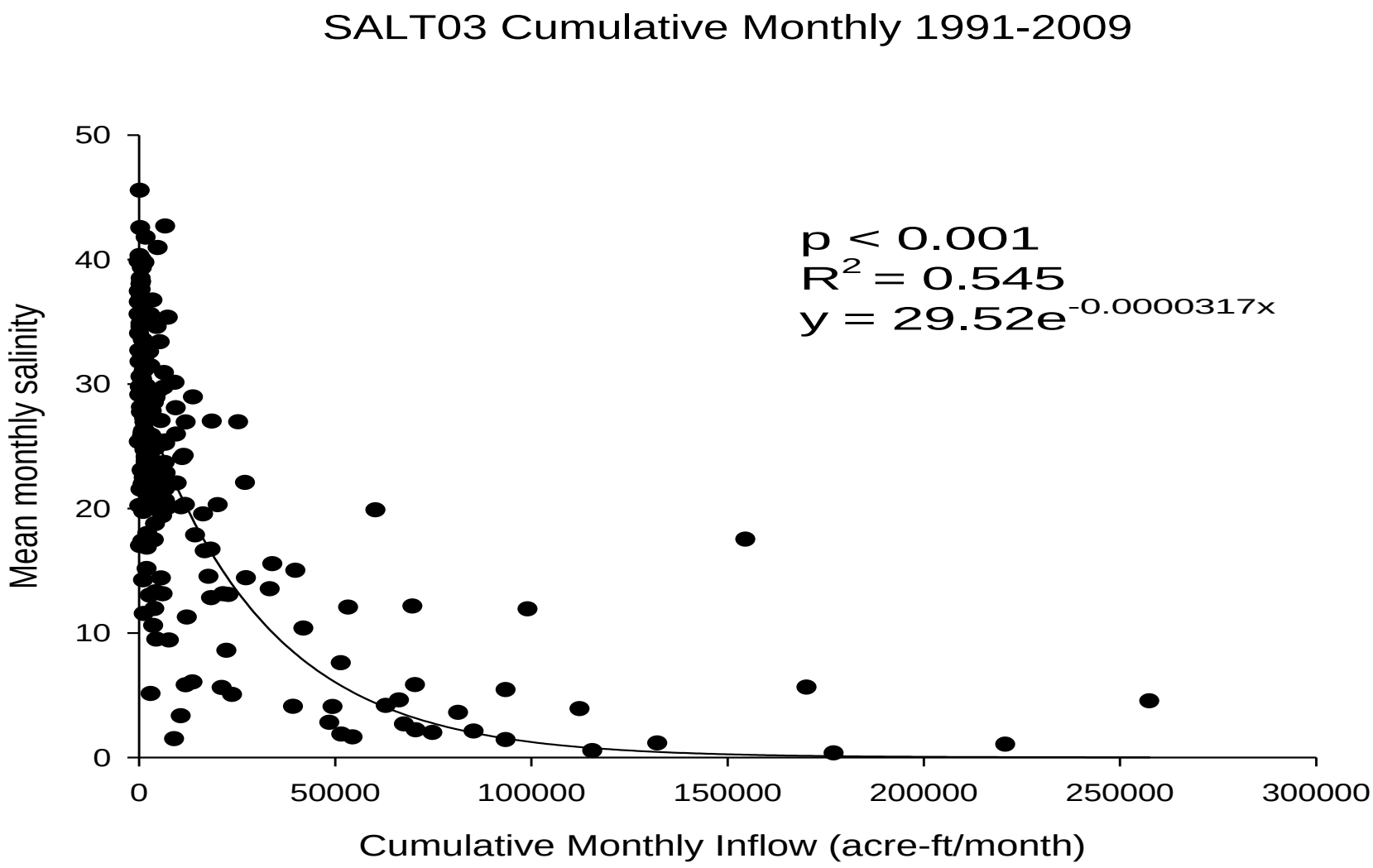
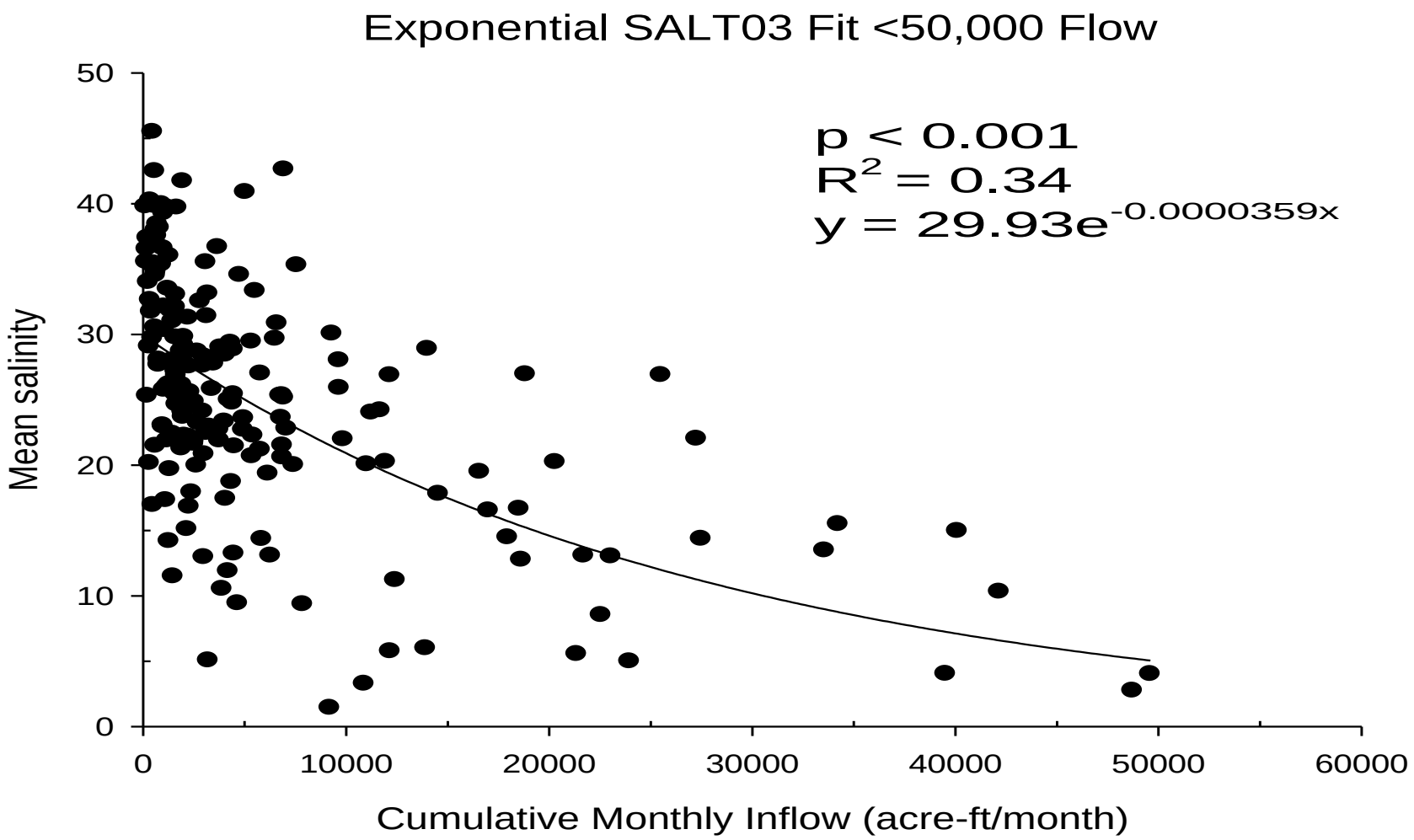


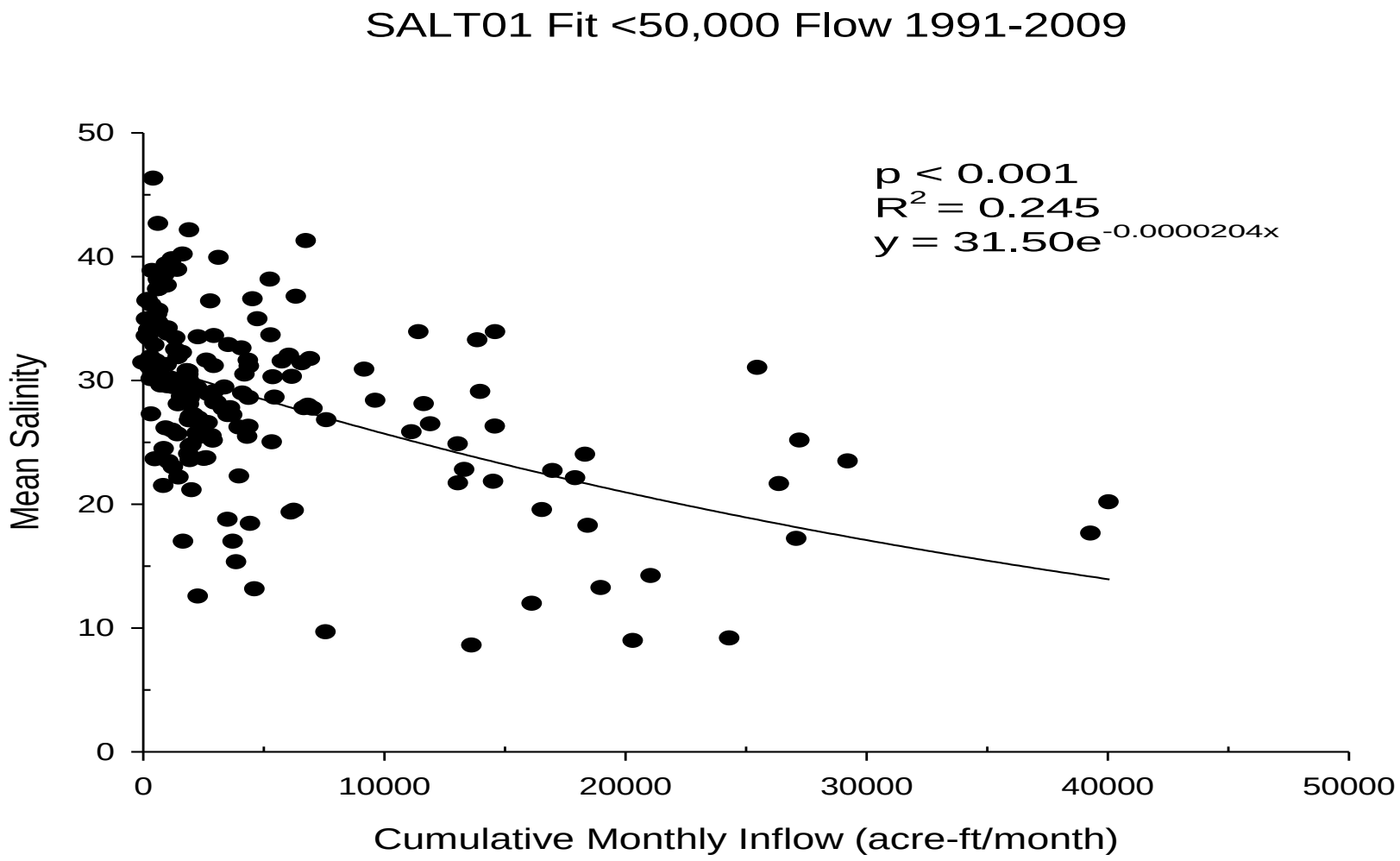
Figure 2. Annual freshwater inflow estimates (in acre-feet) to Nueces Bay between three hydrology datasets for 1987 – 2009; *TWDB201101-Nueces Bay Hydrology* (*blue*), *TxBLEND Calibration Hydrology* (*red*), and *TxBLEND Alternate Hydrology* (*black*).

Nowhere else on TX coast do we have this much empirically measured salinity data…

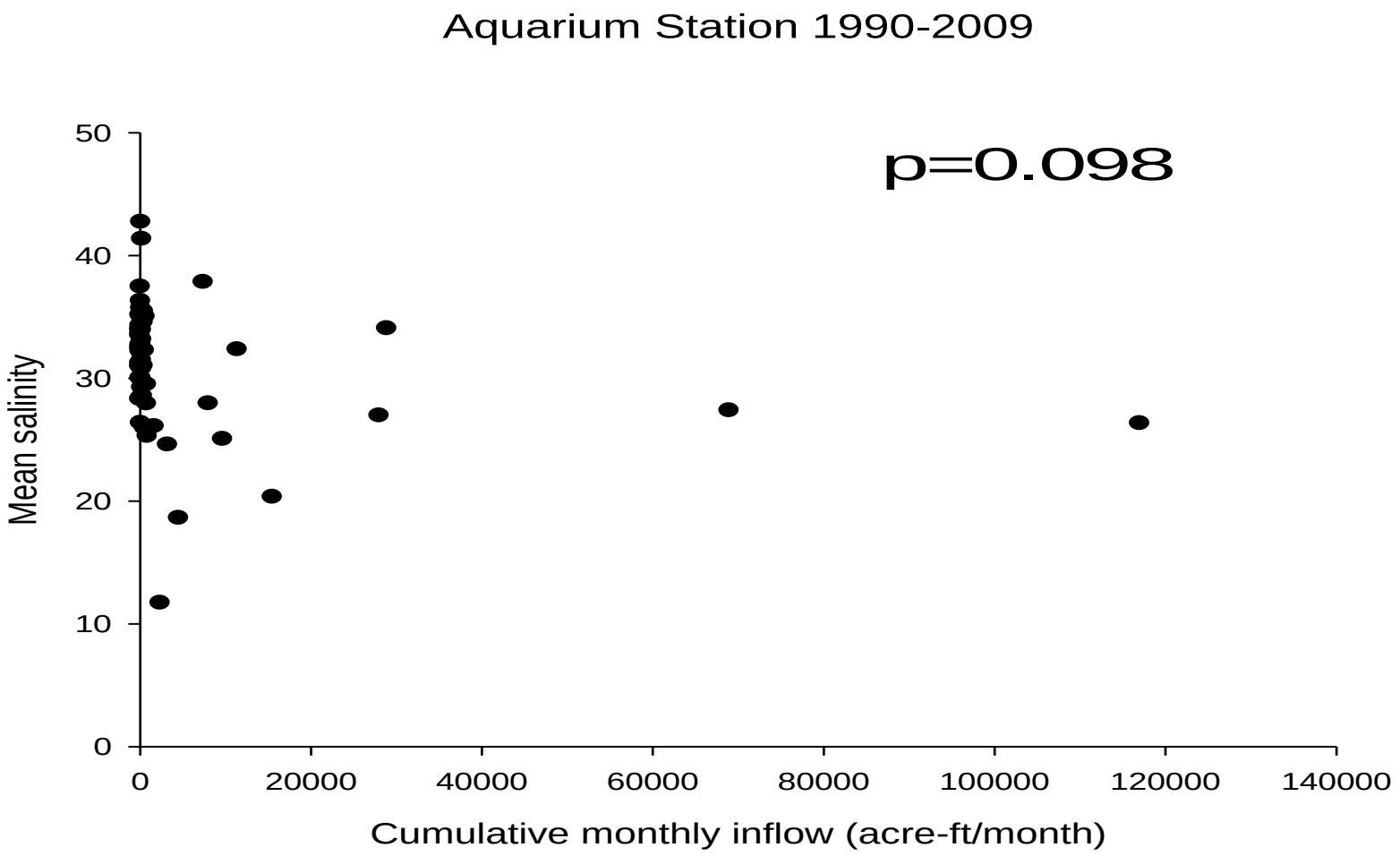


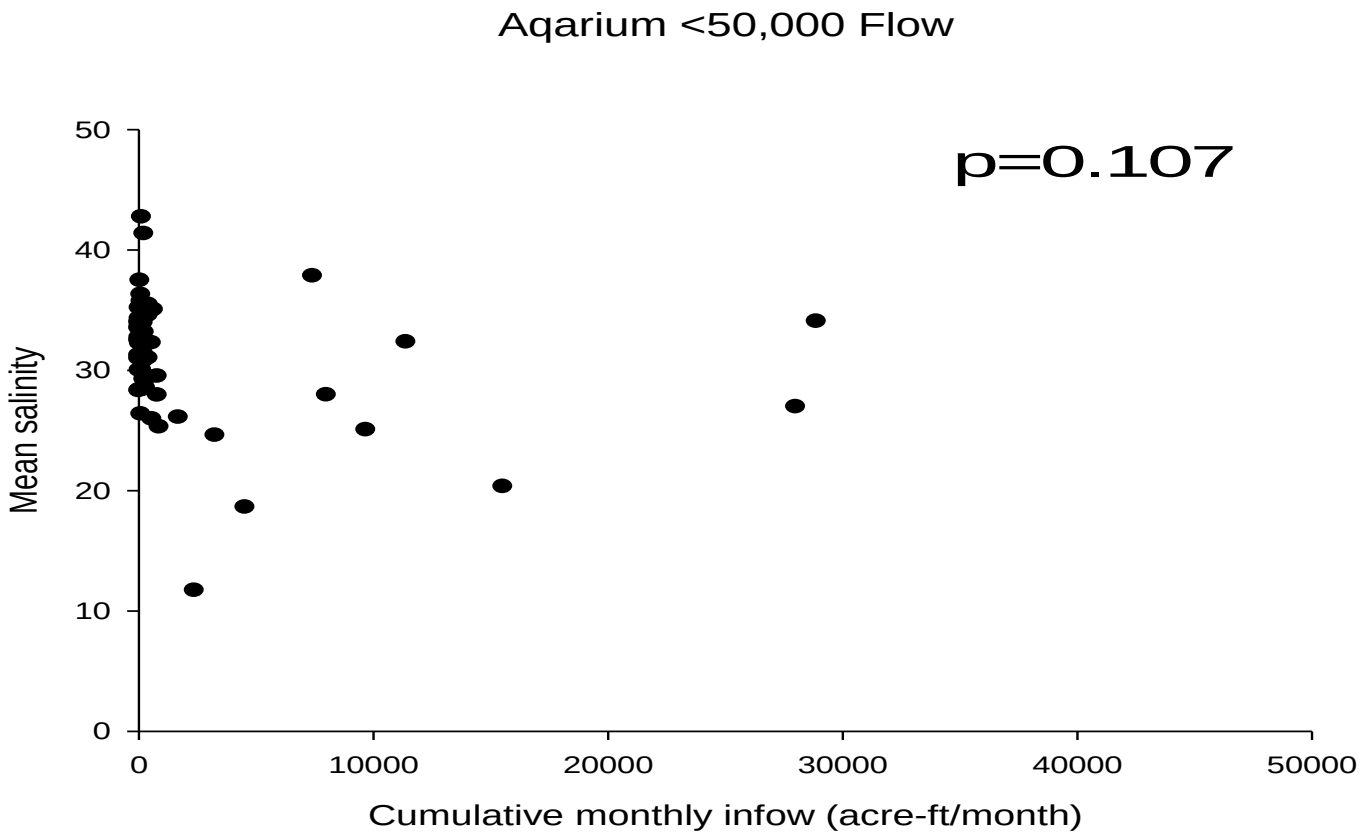

SALT03 Cumulative Monthly 1991-2009
p < 0.001
R2 = 0.545
y = 29.52e-0.0000317x
Mean monthly salinity
Cumulative Monthly Inflow (acre-ft/month)
0
10
20
30
40
50
0
50000
100000
150000
200000
250000
300000

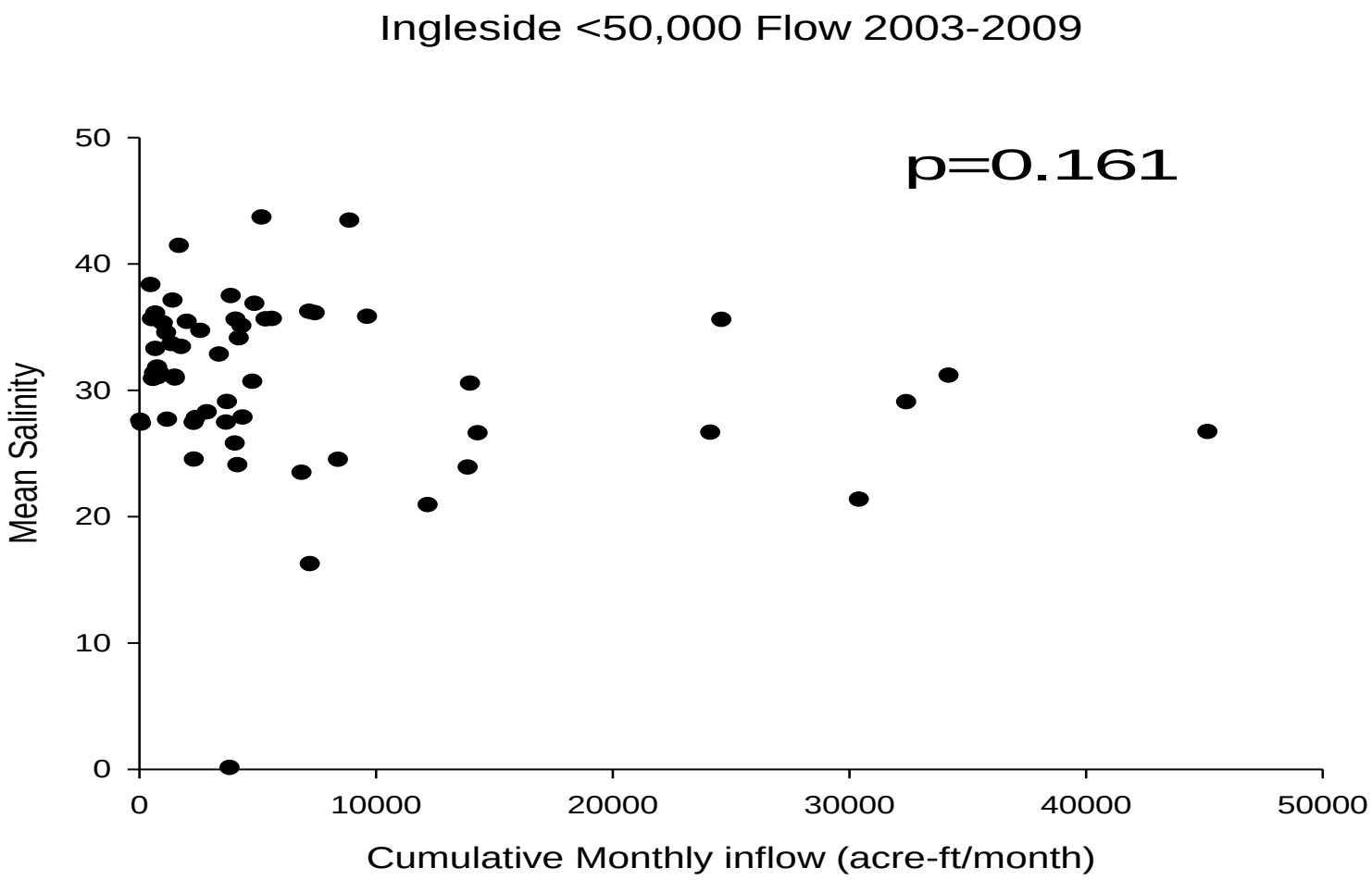

Exponential SALT03 Fit <50,000 Flow
p < 0.001
R² = 0.34
y = 29.93e-0.0000359x
Mean salinity
0
10
20
30
40
50
0
10000
20000
30000
40000
50000
60000
Cumulative Monthly Inflow (acre-ft/month)


SALT01 Fit <50,000 Flow 1991-2009
p < 0.001
R2 = 0.245
y = 31.50e-0.0000204x
Mean Salinity
Cumulative Monthly Inflow (acre-ft/month)
0
10
20
30
40
50
0
10000
20000
30000
40000
50000

Influence of Nueces Bay on Corpus Christi Bay


Aquarium Station 1990-2009
p=0.098
Mean salinity
0
10
20
30
40
50
0
20000
40000
60000
80000
100000
120000
140000
Cumulative monthly inflow (acre-ft/month)


Aqarium <50,000 Flow
p=0.107
Mean salinity
0
10
20
30
40
50
0
10000
20000
30000
40000
50000
Cumulative monthly infow (acre-ft/month)


Ingleside <50,000 Flow 2003-2009
p=0.161
Mean Salinity
0
10
20
30
40
50
0
10000
20000
30000
40000
50000
Cumulative Monthly inflow (acre-ft/month)

Next Steps (SAC Guidance…):

1. **Quantify and finalize relationships between flow and salinity, ecology, etc..**
    1. **Compare regressions to TX Blend**
    2. **Fish and BRTs**

2. **Complete Matrix:**
    1. **Deal with pulses and overbanking**
    2. **Regime – High and Low Flow**
    3. **Attainment and Frequency**

3. **Integrate with In-stream group – how well does this mesh?**

4. **“Write it up”**

Target FW Inflow Needs (in Acre Feet) for Nueces Estuary

From: "Freshwater Inflows Into The Nueces Delta", J. Tunnell, Aug 2010

MONTH	>70%	>40-<70%	>30-<40%	<30%
January	2,500	2,500	1,200	0
February	2,500	2,500	1,200	0
March	3,500	3,500	1,200	0
April	3,500	3,500	1,200	0
May	25,500	23,500	1,200	0
June	25,500	23,000	1,200	0
July	6,500	4,500	1,200	0
August	6,500	5,000	1,200	0
September	28,500	11,500	1,200	0
October	20,000	9,000	1,200	0
November	9,000	4,000	1,200	0
December	4,500	4,500	1,200	0
TOTAL	138,000	97,000	14,400	0

How does the information flow in our process…?

In-stream (HEFR) → Available to Estuary → TX Blend → What if Scenarios (i.e., predict bay/delta salinities)…

- **Reverse?**
- **Integration?**


SHELLING OYSTERS.
CORPUS CHRISTI, TEXAS.
©1925